



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,263	10/27/2003	Shuzo Sato	075834.00448	2807

33448 7590 11/14/2006

ROBERT J. DEPKE  
LEWIS T. STEADMAN  
ROCKEY, DEPKE, LYONS AND KITZINGER, LLC  
SUITE 5450 SEARS TOWER  
CHICAGO, IL 60606-6306

EXAMINER

WILKINS III, HARRY D

ART UNIT PAPER NUMBER

1742

DATE MAILED: 11/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/694,263	<b>Applicant(s)</b> SATO ET AL.	
	<b>Examiner</b> Harry D. Wilkins, III	<b>Art Unit</b> 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 October 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 6-9 and 12-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 6-9 and 12-19 is/are rejected.
- 7) ☒ Claim(s) 20-22 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 10/304,174.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                                  |                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                                                 | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                             | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/31/06</u> . | 6) <input type="checkbox"/> Other: _____                                                |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 16 October 2006 has been entered.

### ***Status***

2. The rejection grounds based on Sharan (US 2003/0062269) have been withdrawn in view of Applicant's amendment clarifying that during the electropolishing step, no mechanical abrasion occurs.
3. The rejection of claims under 35 USC 112, 2<sup>nd</sup> paragraph have been withdrawn in view of Applicant's clarifying amendment.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 6, 7, 12, 13, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh (US 6,066,030) with evidence (for claims 7, 13 and 17 only) from Cheung (US 6,056,864).

Art Unit: 1742

Uzoh teaches (see abstract, figures and col. 5, lines 9-26) a method of polishing a substrate including both electropolishing (ECP) and chemical mechanical polishing (CMP). Uzoh does teach that data collected from sensors regarding the thickness of the metalized layer can be used to "select the optimum recipe of electropolishing and/or CMP processes required"..

Thus, Uzoh does not explicitly teach alternating the ECP and CMP steps.

However, based on the disclosure of Uzoh that one of ordinary skill in the art would have been capable of selecting an optimum *recipe* of ECP and/or CMP processes required, it would have been within the expected skill of a routineer in the art to have optimized the ECP/CMP blend to operate in an alternating manner in order to best achieve the proper blend of the benefits of both processes. Uzoh et al show that the ordinary level of skill in the art included the ability to choose optimum combinations of ECP and CMP to achieve desired polishing.

Regarding claims 7, 13 and 17, Uzoh fails to teach the details of the ECP and CMP processes as claimed. However, one of ordinary skill in the art was aware that ECP occurred at a faster rate (see abstract of Cheung) the CMP, but that CMP achieved a smoother resulting surface. Thus, one of ordinary skill in the art would have expected the process of Uzoh to behave such that the ECP relatively roughened (with respect to the CMP) the surface, and the CMP smoothed the roughened surface.

6. Claims 8, 9, 14, 15, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh (US 6,066,030) in view of Downey et al (US 4,358,338) and Li et al (US 5,559,428).

The teachings of Uzoh are discussed above. Uzoh teach sensors (25, 27) for detecting the end point of the polishing process, by does not teach monitoring a change of a current waveform.

Downey et al teach (see abstract, col. 5, line 63 to col. 6, line 29) a method of detecting an end point in a plasma etching process including detecting the end point based upon a change in the derivative of the current applied to the substrate that would correspond to a change in the etching surface, such as the removal of a metal plating layer on a semiconductor substrate (see Example 1). Thus, in theory, the end point detection scheme disclosed by Downey et al is identical to the presently claimed scheme with the exception of Downey et al being related to plasma etching and not electropolishing.

Li et al teach (see abstract, summary of invention and col. 10, lines 34-38) that sensors for detecting the end points of etching processes are fully interchangeable between plasma etching and electrochemical etching. Therefore, one of ordinary skill in the art would have considered the disclosure of Downey et al to be analogous art.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the end point detection method of Downey et al in the method of Uzoh because the method of Downey et al detects the end point by noticing when a change occurs in the rate of change of the applied current during an etching/polishing step, thereby allowing easy detection of the end point.

***Allowable Subject Matter***

7. Claims 20-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: as indicated in the reasons for allowance in Application No. 10/304,174, the prior art does not teach or suggest decreasing the current during an overpolishing step and stopping the overpolishing when the current density dropped to a predetermined value.


***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1742

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1742

hdw